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404-636-8400

DRAFT

TC/TG/MTG/TRG MINUTES COVER SHEET

(Minutes of all Meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/MTG/TRG No. 5.1 DATE 22 Jan 2018

TC/TG/MTG/TRG TITLE Fans

DATE OF MEETING 22 Jan 2018 LOCATION Chicago, IL

MEMBERS PRESENT	YEAR APPTD	MEMBERS ABSENT	YEAR APPTD	EX-OFFICIO MEMBERS AND ADDITIONAL ATTENDANCE
Franco Cincotti	7/01/16	John Cermak	7/01/14	Asesh Raychaudhuri
Armin Hauer	7/01/16	Chuck Coward	7/01/14	Rad Ganesh
Joseph Brooks	7/01/16	Jay Fizer	7/01/16	Walt Mecozzi
Harold Dubensky	8/06/15	Tim Kuski	7/01/14	Tim Mathson
Brian Reynolds	7/01/16			Adam Sterne
Zhiping Wang	7/01/16			Rob Valbracht
Jay Eldridge	7/01/16			Larry Smith
Michael Feuser	7/01/16			Jeremy Smith
Eric Tingloff	7/01/14			Sanaee Iyama
				Aaron Saldanha
				Asuish Desai

DISTRIBUTION: ***All Members of TC/TG/MTG/TRG plus the following:***	
TAC Section Head:	SH5@ashrae.net
All Committee Liaisons As Shown On TC/TG/MTG/TRG Rosters (Research, Standards, ALI, etc.)	David John davidjohntarpon@gmail.com Dr. Melikov,PhD akm@byg.dtu.dk James Bochat jim.bochat@cxconcepts.com James Arnold jarnold@live.com Folorentino Roson Rodriquez f.roson@supsercontrols.com.ar Michael Bilderbeck mbilderbeck@pickeringfirm.com

Mike Vaughn, Manager Of Research & Technical Services	MORTS@ashrae.net

Note: These draft minutes have not been approved and not the official, approved record until approved by the TC.

Additional Attendance (continued)

Kevin Gildea
Kevin Gebke
Louis Starr
Kristin Sullivan
Jay Baggett
Jamie Yeh
Larry Hopkins
Mark Vanderkooy
Ken Kuntz
Mike Ivanovich
Mark Bublitz
David Carroll
Zash Minear
Paul Lin
Chandra Gollapudi
Rich Stauter
Jennifer Kane
Ned Bent
Greg Wagner
Trent Marshall
Madan Baral
Z. Patrick Chinoda
Mark Fly
Lee Buddrus
Peter Bushnell
Mark DeRoo
Dustin Meredith
Ken Takahashi
Nathan Fetting
Kim Osborn
Ross Mielke
Brent Fullerton
Craig Wray

Chicago, IL | **ASHRAE TC 5.1 Meeting**
Palmer House
Rm: Montrose 1 | **Monday, 22 Jan 2018**
4:15 CST

Minutes

1. Call to Order

The meeting was called to order by the chair at 4:22 pm.

2. Roll Call

The following TC 5.1 voting members were present:

Franco Cincotti –Chair
Armin Hauer – Vice Chair
Joseph Brooks - Secretary
Harold Dubensky - Webmaster
Brian Reynolds – Research S/C Chair
Zhiping Wang – Handbook S/C Chair
Jay Eldridge
Michael Feuser
Eric Tingloff

The following voting members were unable to attend:

John Cermak
Chuck Coward
Jay Fizer
Tim Kuski

Non-Voting S/C Chair:

John Murphy (absent) – Standard S/C Chair
Walter Mecozzi (present) – Program S/C chair

A quorum was present.

3. Adoption of Agenda

The committee approved the agenda by consensus with Lee's presentation moved to the beginning of the business section.

4. Approval of the Minutes

The last meeting of this committee was held on 26 June 2017 in Long Beach, CA.

Motion TC 5.1 - 01-2018

Moved by: Michael Feuser
Seconded: Armin Hauer

"Move to approve the minutes from the 26 June meeting of TC 5.1 as distributed."

Passed unanimously

5. New Business

5.1 An Alternate Efficiency Metric

A presentation promoting the use of an alternate fan efficiency metric for ASHRAE 90.1 was made. The presentation slides are attached. An AMCA member requested time for a rebuttal at the next meeting.

6. Items of business

6.1 ASHRAE Code of Ethics

In this and all other ASHRAE meetings, the ASHRAE Code of Conduct requires us to act with honesty, fairness, courtesy, competence, integrity and respect for others, and that we avoid all real or perceived conflicts of interests. (See full Code of Ethics: https://www.ashrae.org/about-ashrae/ashrae-code-of-ethics.)

6.2 TC 5.0 Section Head/Liaison Reports

The new section head, Larry Smith introduced himself. His report included:

- Student Activities committee met on Saturday with 400 young men and women discussing their exciting activities.
- TAC and CEC have a good working relationship. Please copy the section leader on all program submittals.
- Asked all to think about the question, why are you here? If anyone wants a letter of appreciation, please inform the section head (e-mail: SH5@ashrae.net)

6.3 Chairman's report

The chair reported the following information from the section meeting:

- The Committee Scope of TC 5.1 is: TC 5.1 is concerned with the selection, application and testing-for-rating of fans, including recommended installation practices and field test procedures. Members of the TC should consider at next meeting if the scope should be revised or expanded.

- Program proposal deadline for next meeting is 9 Feb 2018

- 2019 – 2020 is ASHRAE's 125th anniversary. ASHRAE is asking for papers on technologies and topics that occurred between 1920 – 2000; the topic can be specific or broad, and should document the history.

- Remote participation – deadline 9 Apr 2018.

6.4 Old business

No other old business was brought to the floor.

7. Subcommittee reports

7.1 Standards subcommittee – John Murphy

7.1.1 ASHRAE 149-2013: Laboratory Methods of Testing Fans Used to Exhaust Smoke in Smoke Management Systems

This standard was withdrawn and will not be reported upon again.

7.1.2 ASHRAE 51/AMCA 210

It was reported that, in reply to an interpretation request for AMCA 210-16, it was clarified that the testing of fan arrays was not strictly in the scope of AMCA 210 and that other standards would be better suited for aerodynamic test of fan arrays.

7.2 Handbook subcommittee

Zhiping reported on the activities of this subcommittee. Handbook liaison will be asked when revisions are due. S/C will be looking at outside reviewer comments. S/C is also reviewing Table 1 revisions and a reader's comment that pointed out an error. A small group of S/C members will be looking at efficiency metric sections. The S/C will be looking at adding a section on fan airflow measurement.

The subcommittee chairs report is attached.

7.3 Research subcommittee

The research subcommittee reported on the activities of the research subcommittee. His report is attached.

7.4. Program subcommittee

The program subcommittee chair reviewed the program track for the Houston meeting. Program topics from the committee were suggested. The subject of fan efficiency metrics, it was thought it would be a good panel discussion for Houston program.

7.5 Efficiency metric subcommittee – Tim Mathson

The chair reported that the subcommittee has met three times since the Long Beach meeting. Recommendations from the subcommittee to the main committee were discussed: that the fan power limits remain in SSPC 90.1, and that FEG be deleted or replaced. Other motions, to table the recommendation to TC 5.1 to substitute anything for FEG at this time, and another to take the motion for more data off the table were reported upon.

The committee was asked for suggestions on how this subcommittee can move ahead more efficiently. It was noted that the SSPC 90.1 Mechanical Subcommittee (MSC) chair provided some clear direction, and that the MSC will modify to improve the fan power limit. Also, it appeared that consultants would like to see a fan efficiency proposal in parallel with the fan power limit work.

Motion TC 5.1 - 02-2018

Moved by: Armin Hauer
Seconded: Michael Feuser

"Move that the TC recommends that the ASHRAE 90.1 section 6.5.3.1.3 'Fan Efficiency' be deleted or replaced with a new fan efficiency metric."

Passed 6 Yes, 2 – No, 0 – Abstentions
(chair did not vote)

During the discussion, the question was raised on the content of Section 6.5.3.1.3 of Standard 90.1. It was provided:

6.5.3.1.3 Fan Efficiency

Fans shall have a *fan efficiency grade* (*FEG*) of 67 or higher based on *manufacturers'* certified data, as defined by AMCA 205. The total *efficiency* of the fan at the design point of operation shall be within 15 percentage points of the maximum total *efficiency* of the fan.

Exceptions to 6.5.3.1.3

1. Individual fans with a motor *nameplate horsepower* of 5 hp or less that are not part of a group operated as the functional equivalent of a single fan.
2. Multiple fans in series or parallel (e.g., fan arrays) that have a combined motor *nameplate horsepower* of 5 hp or less and are operated as the functional equivalent of a single fan.
3. Fans that are part of *equipment* listed under Section 6.4.1.1.
4. Fans included in *equipment* bearing a third-party-certified seal for air or *energy* performance of the *equipment* package.
5. Powered *wall/roof* ventilators (*PRV*).
6. Fans outside the scope of AMCA 205.
7. Fans that are intended to only operate during emergency conditions.

8. Website Report

The TC 5.1 webmaster reported the analytics for the TC website. They are attached.

9. Time and Place of Next Meeting

The next meeting will be held in conjunction with the Houston Annual meeting on 25 June 2018

10. Adjournment

The meeting adjourned at 6:35 pm CST.

Attachments:
1) An alternate metric presentation
2) Handbook subcommittee report
3) Research subcommittee report
4) TC 5.1 Website analytics

90.1 Fan Efficiency Standards

Where do we go now?

Lee Buddrus

President

Acme Engineering & Manufacturing

Background

- Past President of AMCA. Founder and Chairman of the AMCA Committee on Codes– Air Movement Code Action Review Committee AMCARC
- Rice U-Math and EE, Masters-- Project Lead– NASA Space Shuttle

NOT REPRESENTING AMCA!!!!!

For the United States, Some Agree, Most Do Not

Asia/Europe

IECC April 2013 Dallas Meeting

Unanimous Vote, 2 minutes to decide
600+Proposals 90% Fail
Too Complex
Too Difficult to Enforce
Why FEG-IECC Voters Stated
1. Simple to Understand, 1 Number, And is Best Efficiency
2. Easy to Enforce, Equipment Label Equipment can be checked

FEI

Not Simple-208-32 pages and climbing
Enforcement Issue—Two Points
Manufacturer and Design Point

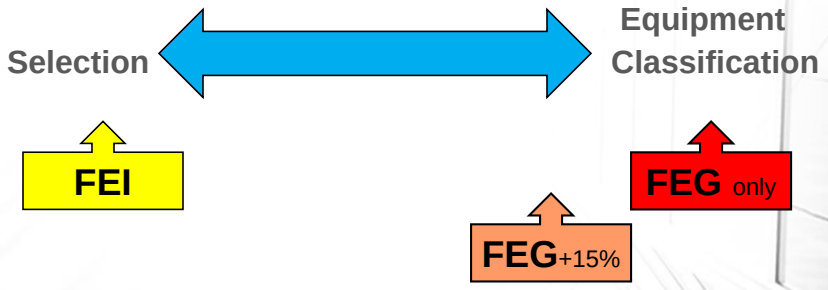
Equipment & Selection Standard

- FEG as Originally Proposed = Equipment Standard
- DOE First Notice Standard = Equipment Standard Only
- FEI = Equipment Standard + Selection Standard

Please not an Energy Equipment Classification Standard similar to the rest of the 90.1 equipment tables

15% Selection for FEG
Both Equipment & Selection

Added-- IGCC Code Meeting
15% criticized



Not Opposed to Selection Metric

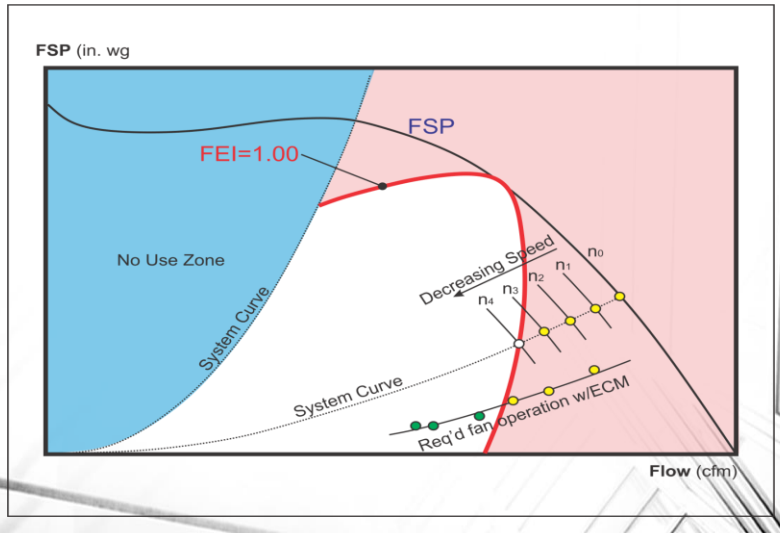
90.1 Already Incorporates

- Fan Power Limitations
- Allows Flexibility for Designer
- Easy to Understand
- Easily checked/enforced

FEI Limitations

- Customer supplies A Single Operating Point
- Our World is now ECM/VFD- infinite operating points, with variation in operation time
- Which Point?
- Enforcement

Are We All In? Partially In? Design Point What We Want!



Good for Goose Good for Gander

90.1 1200 Pages

Tables are as follows:

a. Table 6.8.1-1, "Electrically Operated Unitary Air Conditioners and *Condensing Units*—Minimum *Efficiency* Requirements"
b. Table 6.8.1-2, "Electrically Operated Unitary and Applied Heat Pumps—Minimum *Efficiency* Requirements"
c. Table 6.8.1-3, "Water-Chilling Packages—*Efficiency* Requirements" (See Section 6.4.1.2 for water-cooled centrifugal water-chilling packages that are designed to operate at nonstandard conditions.)
d. Table 6.8.1-4, "Electrically Operated *Packaged Terminal Air Conditioners*, *Packaged Terminal Heat Pumps*, *Single-Package Vertical Air Conditioners*, *Single-Package Vertical Heat Pumps*, *Room Air Conditioners*, and *Room Air Conditioner* Heat Pumps—Minimum *Efficiency* Requirements"
e. Table 6.8.1-5, "Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters—Minimum *Efficiency* Requirements"
f. Table 6.8.1-6, "Gas- and Oil-Fired *Boilers*—Minimum *Efficiency* Requirements"
g. Table 6.8.1-7, "Performance Requirements for Heat-Rejection *Equipment*"
h. Table 6.8.1-8, "Heat Transfer *Equipment*"
i. Table 6.8.1-9, "Electrically Operated Variable-Refrigerant-Flow Air Conditioners—Minimum *Efficiency* Requirements"
j. Table 6.8.1-10, "Electrically Operated Variable-Refrigerant-Flow and Applied Heat Pumps—Minimum *Efficiency* Requirements
k. Table 6.8.1-11, "Air Conditioners and *Condensing Units* Serving *Computer Rooms*"
l. Table 6.8.1-12, "Commercial Refrigerators and Freezers—Minimum *Efficiency* Requirements"
m. Table 6.8.1-13, "Commercial Refrigeration—Minimum *Efficiency* Requirements"
n. Table 6.8.1-14, "Vapor-Compression-Based *Indoor Pool Dehumidifiers*—Minimum *Efficiency* Requirements"
o. Table 6.8.1-15, "Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, without *Energy* Recovery—Minimum *Efficiency* Requirements"
p. Table 6.8.1-16, "Electrically Operated *DX-DOAS Units*, Single-Package and Remote Condenser, with *Energy* Recovery—Minimum *Efficiency* Requirements"

All furnaces with input ratings of ≥225,000 Btu/h, including electric furnaces, that are not located within the *conditioned space* shall have jacket losses not exceeding 0.75% of the input rating. Air conditioners primarily serving *computer rooms* and covered by ASHRAE Standard 127 shall meet the requirements in Table 6.8.1-11. All other air conditioners shall meet the requirements in Table 6.8.1-1.

Additional Issues

- Technical Issue- Total Efficiency on Some Fans, Static Efficiency on Other Fans
- Europe-Compares TE Applications to TE Applications and SE Applications to SE
- Asia- Uses Total Efficiency.
- USA- Defies Physics & Thermodynamics
- For Selection you should use Static or Total
- But to compare equipment on energy use—Total Only--- TE = PE + KE

Additional Issues

- If you could enforce the Design Point(s) Selection(s) as well as the Manufacturer's Efficiency Catalog
- Are the Design Point(s) the Actual Operating Point(s) and if not, are you still saving energy.
- Numerous DOE and ASHRAE Studies'
- Last but not Least- If you don't supply a design point, must be under a Max RPM, but can still be outside the FEI bubble not saving any energy. Rehab Market is growing.
- Distributor Market

WHY FEI

- Manufacturer Support- Change computer program.
- Motivation to improve Fan Energy Efficiency is Minimal
- DOE First NOPR– (FEI originally called PBER)
- "DOE understands that neither of the two PBER approaches are likely to require redesign of a fan model that does not meet the PBER. Instead, the operating range of the fan model would be restricted to meet the PBER requirements."
- Customers make modifications and incur brunt of energy improvement cost , if there is any energy saved
- DOE?????

FEG in 90.1 Today

- "**6.5.3.1.3 Fan Efficiency.** Fans shall have a fan efficiency grade (FEG) of 67 or higher based on manufacturers' certified data, as defined by AMCA 205. The total efficiency of the fan at the design point of operation shall be within 15percentage points of the maximum total efficiency of the fan.
  - **Exceptions:**
    - 1. Single fans with a motor nameplate horsepower of 5 hp or less
    - 2. Multiple fans in series or parallel (e.g., fan arrays) that have a combined motor nameplate horsepower of 5 hp or less and are operated as the functional equivalent of a single fan
    - 3. Fans that are part of equipment listed under Section 6.4.1.1
    - 4. Fans included in equipment bearing a third party-certified seal for air or energy performance of the equipment package
    - 5. Powered wall/roof ventilators (PRV)
    - 6. Fans outside the scope of AMCA 205
    - 7. Fans that are intended to only operate during emergency conditions"

A Better FEG

- Eliminate 15% Requirement
- Eliminate Following Exception

  Powered wall/roof ventilators (PRV)

A Better FEG-From 90.1 Tables
Table 6.1.8-7 Heat Rejection (by Fan type)

6 Heating, Ventilating, and Air Conditioning

Table 6.8.1-7 Performance Requirements for Heat Rejection *Equipment*—Minimum *Efficiency* Requirements

Equipment Type	Total *System* Heat-Rejection Capacity at Rated Conditions	Subcategory or Rating Condition[b]	Performance Required[a,b,c,f,g]	Test Procedure[d,e]
Propeller or axial fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥40.2 gpm/hp	CTI ATC-105 and CTI STD-201 RS
Centrifugal fan open-circuit cooling towers	All	95°F entering water 85°F leaving water 75°F entering wb	≥20.0 gpm/hp	CTI ATC-105 and CTI STD-201 RS
Propeller or axial fan closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥16.1 gpm/hp	CTI ATC-105S and CTI STD-201 RS
Centrifugal closed-circuit cooling towers	All	102°F entering water 90°F leaving water 75°F entering wb	≥7.0 gpm/hp	CTI ATC-105S and CTI STD-201 RS
Propeller or axial fan evaporative condensers	All	R-507A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥157,000 Btu/h-hp	CTI ATC-106
Propeller or axial fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥134,000 Btu/h-hp	CTI ATC-106
Centrifugal fan evaporative condensers	All	R-507A test fluid 165°F entering gas temperature 105°F condensing temperature 75°F entering wb	≥135,000 Btu/h-hp	CTI ATC-106
Centrifugal fan evaporative condensers	All	Ammonia test fluid 140°F entering gas temperature 96.3°F condensing temperature 75°F entering wb	≥110,000 Btu/h-hp	CTI ATC-106
Air cooled condensers	All	125°F condensing temperature 190°F entering gas temperature 15°F subcooling 95°F entering db	≥176,000 Btu/h-hp	AHRI 460

a. For purposes of this table, open-circuit cooling tower performance is defined as the water flow rating of the tower at the thermal rating condition listed in Table 6.8.1-7 divided by the fan motor nameplate power.
b. For purposes of this table, closed-circuit cooling tower performance is defined as the process water flow rating of the tower at the thermal rating condition listed in Table 6.8.1-7 divided by the sum of the fan motor nameplate power and the integral spray pump motor nameplate power.
c. For purposes of this table, air-cooled condenser performance is defined as the heat rejected from the refrigerant divided by the fan motor nameplate power.
d. Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
e. The efficiencies and test procedures for both open- and closed-circuit cooling towers are not applicable to hybrid cooling towers that contain a combination of separate wet and dry heat exchange sections. The certification requirements do not apply to field-erected cooling towers.
f. All cooling towers shall comply with the minimum efficiency listed in the table for that specific type of tower with the capacity effect of any project-specific accessories and/or options included in the capacity of the cooling tower.
g. For purposes of this table, evaporative condenser performance is defined as the heat rejected at the specified rating condition in the table, divided by the sum of the fan motor nameplate power and the integral spray pump nameplate power.
h. Requirements for evaporative condensers are listed with ammonia (R-717) and R-507A as test fluids in the table. Evaporative condensers intended for use with halocarbon refrigerants other than R-507A must meet the minimum efficiency requirements listed above with R-507A as the test fluid.

Similar to all 90.1 Tables add FEG minimum efficiency by type of fan

Wheel Type	Equipment Category	Min Eff
Axial	Vaneaxial-Inline-(Includes Jet Fans with Vane)	60
Axial	Tubeaxial-Inline-(Includes Jet Fans without Vanes)	53
Axial	Panel Propeller Fans	50
Axial	Power Roof/Wall Ventilators	45
Centrifugal	Housed Backwardly Inclined-Single Thickness and Airfoil	67
Centrifugal	Housed Forward Curved	60
Centrifugal	Housed Radial Bladed	53
Centrifugal	UnHoused	60
Centrifugal	Inline	45
Centrifugal	Power Roof/Wall Ventilators	45
Mixed Flow	InLine	48
Circulators	Circulating Fans: Ceiling Fans, Box Fans, Table Fans, Personal Coolers	*
Specialty	Air Curtains	*
Specialty	Ceiling Exhaust Fans	*
Specialty	Crossflow Fans	*
Specialty	Laboratory Exhaust Fans-Induced or High Velocity Discharge	Exempt

* Equipment has a different metric, e.g. cfm/watt, etc.

Summary of Improvements to Current 90.1 Fan Energy Standard

1. Delete 15% Requirement
2. Eliminate an exemptions
3. Add Min Efficiency by Type of Fan
4. Fan Power Limitations to Insure Better Selections

Future Improvements

FMEG similar to Europe

AMCA was almost complete

FMEG Will require additional study and investigation

Could propose 3pt BEP avg

Slightly more complicated but still very simple, still one number metric, really not needed


Thank You

TC 5.1 Handbook Subcommittee Notes (01/21/2018)

By Zhiping Wang

- According to the ASHRAE publication schedule, our revised and TC approved Fan chapter for the 2020 ASHRAE Handbook volume will be due first half of 2019. I will contact our handbook liaison after this meeting to find out the exact due date for our chapter and plan our schedule accordingly.
- Two outside reviewers' comments about our chapter were briefly reviewed in our last two subcomm. meetings. We will address those comments when we actually revise/rewrite the contents.
- One user identified a "copy and paste" error in Table 1 for the propeller fan performance curve, and more importantly, the current nomenclature (Wo) and definition for fan power curve in the performance graph is wrong and will be fixed in this revision cycle.
- During our last meeting, we agreed to revise the Selection section. A small group of members (Craig Wray, Greg Wagner, Tim Mathson, and Kim Osborn) volunteered to review and revise the section. Once they work out a draft version, I will schedule a separate meeting to review the content.
- Tim Mathson and a few AMCA members put together a new Table 1 (new format and content) and it was forwarded to the members before this meeting. Send your comments/suggestion to me after you review it. We will schedule a separate meeting to review/discuss it as a group.
- Armin Hauer will draft a new section about "Instrumented Inlet Cone" based on the already published AMCA-600.
- As always, we are open for ideas, suggestions, and Handbook Online stuff.

List of Potential Topics for 2020 Version of the Fan Chapter

- **Fan Efficiency – New section to define and discuss total efficiency vs. static efficiency**
  - **Examples of proper fan selection to save energy**
  - **Fan Selection (Total pressure based vs. Static pressure based)**

  Actions: Wait after DOE publishes the new regulation on fans?
- **Fan Drive System – Direct Drive vs. Belt Drive, VFD, VSD, etc.**
  Actions: 05/23/14 – Greg S., Chuck, and Zhiping will draft up the content. Craig suggested Chpt.18 (9th ed.) of Fan Engineering covers information about motors and drives. AMCA 203 also has good information. AMCA 207 maybe, too.
- **Fan Part Load?**
  Actions: 05/23/14 – Good topic but Committee decided to put it on the parking lots for now. Maybe for next revision cycle after we collect enough information.
- **Fan Stall (Greg Sanchez wrote some content during our last revision cycle and will investigate further)?**
  Actions: 05/23/14 - Greg will send out information before the Seattle meeting for the committee members to review.
  06/29/14 - Greg Sanchez will have the information ready by mid. July. 01/25/15 – No content yet. Will push back for next revision cycle.
- **Fan Noise (Greg S., predicting fan noise – AMCA 301, or aerodynamic noise?)**
  Actions: 05/23/14 - Good topic. Committed decided to put it on the parking lots for now. Maybe for next revision cycle. Reference Bill Cory's book and the Fan Engineering.
- **Fan Law Applications and System Curves** – Craig Wray already sent the revised content last year. Need to review the content.
- **Handbook Online** - Some ideas came out from our last HB meeting.
  - 3D models of different types of fans and interactive performance curves within Table 1;
  - Interactive curves to demonstrate the fan laws;
  - Interactive contents to show the stall/surge;

TC 5.1 (Fans) Research Sub-Committee Report
January 22, 2018 (Chicago)

WS & RTAR's in progress

1. Notes from Research Subcommittee Chairs Breakfast meeting
   - Added a March 15 deadline for RTAR and WS submissions
   - Now it is M-M-A-D
   - PMS training will be held in Spring 2018
   - Only 2 RTARS's were considered at the RAC meeting (both accepted)
   - Only 2 Work Statements were considered, both returned
   - Voted to release all 15 outstanding TRP's for bid
   - That includes WS 1769
   - Dennis Loveday is the new RL for Section 5
2. WS 1769 – 'Experimental Evaluation of (the Part Load) Efficiency of V-Belt Drives used on Fans' – (authors Tim Mathson and Craig Wray)
   - We should know by the summer meeting what bids are received.
   - PES – Craig Wray, Tim Mathson, Brian Reynolds
   - PMS – typically same as PES members
   - RL suggests to add 1 or 2 more PES/PMS members
3. RTAR 1829 - Inlet and Discharge Installation Effects on Multiple Plenum Fans in a Parallel Arrangement (authors Dustin Meredith & Patrick Chinoda)
   - RTAR approved
   - Distributed the RTAR to the TC members and corresponding members prior to Chicago
   - At the Research Subcommittee meeting, Kim Osborn, Patrick Chinoda, and Larry Hopkins agreed to be WS authors.
   - Goal is to draft a WS for TC letter ballot prior to Houston, including RL review.

4. Entrained Flow Stacks RTAR (TC 9.10) – looking for TC 5.1 volunteers for PES, PMS. Brent Fullerton, others?

Is any Fan Research needed to support the Handbook or the Fan Efficiency Committee? Committee could not think of anything.

Proposed new RTAR

Topic	**Contact**	**Comments**
EC fan & motor vs. traditional fan with induction motor & inverter (Air & sound)	Rad Ganesh & Tim Mathson	Confirm plans & timing prior to Houston meeting

Reviewed & scrubbed old list of possible fan research topics including from the MTG.

1. Fan load profile data. Energy Plus could be a resource for data, could be a student led project. Check with Craig Wray for suggestions on direction & potential for an RTAR.
2. Peter Bushnell suggestion – need specific speed chart examples for fan selection guidance. Sounds like handbook rather than research.

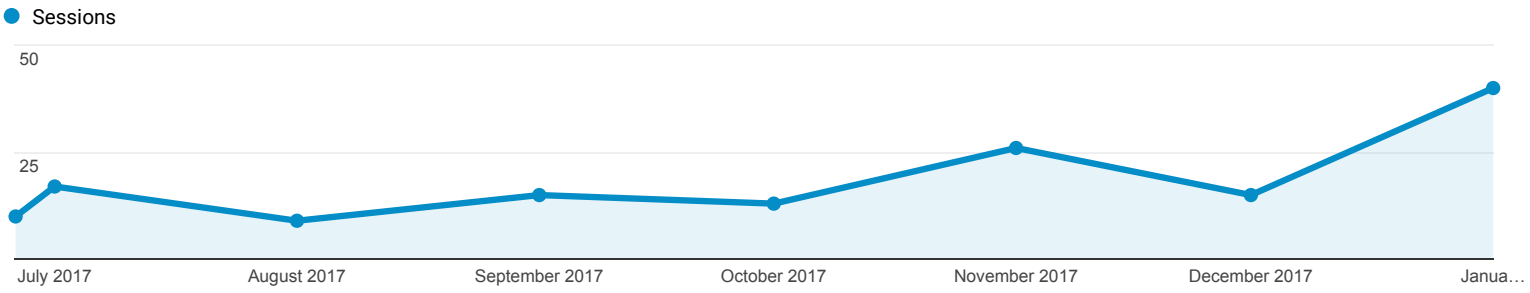
Other Fan research ideas? Send ideas to TC 5.1 Research Chair (Brian Reynolds)

Audience Overview

All Users
100.00% Sessions

Jun 26, 2017 - Jan 20, 2018

Overview



Sessions
145

Users
131

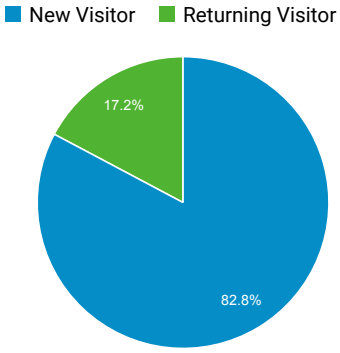
Pageviews
325

Pages / Session
2.24

Avg. Session Duration
00:01:36

Bounce Rate
60.00%

% New Sessions
82.76%



	Country	Sessions	% Sessions
1.	United States	92	63.45%
2.	China	19	13.10%
3.	Iran	8	5.52%
4.	India	6	4.14%
5.	Italy	3	2.07%
6.	Canada	2	1.38%
7.	Germany	2	1.38%
8.	United Kingdom	2	1.38%
9.	Thailand	2	1.38%
10.	Vietnam	2	1.38%